these are dealt with in the appendix referred to. A special interest, befitting the occasion, seems to have been taken by several subscribers in the problems so gorgeously dressed up and so prettily put before them. Not only were solutions forthcoming which were correct and neat, but now and then a talented contributor emulates the author himself in regard to the manner and style of wording the answer.

Whilst ample meed of praise is awarded to all good work—and the author's fund of humour never seems to fail him, causing even the initials of his anonymous correspondents to lend themselves to give point to his remarks—where there is any falling away from his high standard of excellence, the criticisms are serious enough, and, if need be, severe.

Fallacies and shortcomings in the answers are laid bare as mercilessly as in the treatise on "Euclid and his Modern Rivals." But great care is taken to bring home to the mind of the hapless contributor a full sense of the error into which he has fallen; and there are several very apt analogies and illustrations to be found in this appendix.

When the sketches first appeared, editors of the puzzle columns of other magazines must have been filled with "mingled feelings of admiration and despair" as they viewed these emanations from Lewis Carroll. And we do not doubt that very many mathematical tutors, as well as their pupils, will read with pleasure and profit "A Tangled Tale," and the appendix thereto, and feel deeply grateful to the author for publishing in book form this further example of his genius.

Mr. Frost has furnished a very striking frontispiece; and of his other illustrations the last may be specially noted here, wherein is depicted a martyr to experimental science who remains steadfast and unmoved at his observations whilst the waves close round and drown him: this is apropos of an exceedingly clever and entirely new "hydrostatic paradox," which the author has invented by dressing up, with the aid of Lardner's "Physics," a very old fallacy.

A. R. WILLIS

Tableaux-Résumés des Observations Météorologiques faites à Bruxelles pendant une période de cinquante années (1833-1882). Préparés par A. Lancaster. I. "Température de l'Air." (Bruxelles, 1886.)

IN this pamphlet of seventy-nine pages Mr. Lancaster admirably resumes the observations of the temperature of the air made at Brussels during the fifty years from 1833, when they were begun by Quetelet, to the end of 1882. An important consideration kept in view throughout is the climatological aspects of the observations, particularly the frequency or rareness of certain temperatures in different times of the year which bear more or less immediately on vegetable and animal life.

From 1833 to 1877 the observations were made with thermometers exposed 10 feet above the ground at a north window of the Observatory; but from the beginning of 1878 the thermometers were placed in a Stevenson screen in the garden at a point 16 feet distant from their original position, and at a height of 4½ feet from the ground. Care was taken at the time of the change to make a double series of observations in the two positions, from which it is shown that the earlier series were 0°·8 too high as compared with the observations made with the Stevenson screen arrangement.

The mean annual temperature of Brussels is 50°·5. The highest annual temperature was 53°·8 in 1834, and the lowest 47°·1 in 1879, there being thus a difference of 6°·7. During the fifty years the greatest difference in the temperature which occurred in the space of any one day was 37°·4 on January 26, 1881. In midsummer the daily maximum occurs at 3.22 p.m., and the minimum at 3.39 a.m.; but in midwinter these phases of the temperature occur at 3.39 p.m. and 6.36 a.m. As regards very high temperatures, 90°·0 or upwards has not been observed earlier than June 6 or later than August 19; and as regards the periods of intensest cold, a temperature of zero Fahr. has been recorded only between January 16 and 26. The longest continued frost was in 1845, when from February 7 to March 22, or during 45 days, the temperature fell to freezing or lower each successive day. The hardest winter was that of 1844-45, when temperature fell to freezing on 90 days, and the most open winter that of 1846-47, when frost was recorded only on 17 days. January 1838 was characterised by severe and long-continued frosts, temperature falling to 23°·0 or lower on 22 consecutive days, to 14°·0 on 13 days, and to 5°·0 on 5 days. The absolutely lowest temperature recorded was −4°·4 on January 25, 1881, and the highest 95°·4 on July 19 of the same year. The five mean coldest consecutive days of the year are January 8 to 12, the mean being 34°·4; and the five warmest July 15 to 19, the mean being 66°·5. A second maximum occurs from August 13 to 17, when the mean is 65°·5. The most marked interruptions in the annual rise of temperature from January to July are February 10 to 14, April 10 to 14, the middle of May, and June 26 to July 2; and the interruptions in the fall of temperature from July to January are August 13 to 17, already referred to, and December 4 to 7. The interest of these temperature interruptions is their wide geographical range, and no quite satisfactory explanation of them has yet been given.

Notes from the Leyden Museum. Vol. VII. (1885.)

UNDER the able editorship of Dr. F. A. Jentink, the Director of the Leyden Museum, these "Notes" have been published as quarterly parts throughout the past year. They form a volume of some 286 pages, which is illustrated by 10 plates. Among the more important "Notes" we may mention a monograph of the genus Cuscus by the Editor. Four species are recognised: *C. orientalis*, *C. celebensis*, *C. maculatus*, and *C. ursinus*. Gray's species, *C. celebensis*, is re-described. if indeed the original description can be said to merit such a title, being contradictory on most important points, and illustrated with figures of another species. In a note on some rare mammals the same author describes and figures *Hapalemur griseus* and *H. simus*, and notes the occurrence in Central Africa of *Epomophorus comptus* and *E. gambianus*, of *Paradoxurus stigmaticus* and *Ptilocercus lowii* from North-East Sumatra. He also re-describes, almost re-discovers, the rare *Antelope doria*, Ogilby, and *A. longiceps*, Gray. Mr. J. Büttenkofer's "List of Birds collected in Western Liberia" is prefaced by a most interesting account of the Zoological Expedition sent out to the West Coast of Africa under the supervision of the late Prof. Schlegel. Two years and a half (1880-82) were spent in Western Liberia, of which a rough sketch-map is given. The ordinary temperature of Liberia may tolerably well be compared to that of a European summer, rarely ever becoming insupportable. It has its dry and rainy seasons, and produces an extremely rich flora and fauna. His companion, C. F. Sala, died in June 1881, and Mr. Büttenkofer, from ill-health, was obliged to leave for Holland in April 1882. Mr. Stampfli has since gone out, and is now carrying on very successful researches in the southern portions of the district. This paper on the birds of Liberia is to form but one of a series devoted to the different groups collected.

The entomological notes are numerous, and contain descriptions of new or rare Coleoptera by C. Ritsema, J. W. van Lansberge, Neervoort van de Poll, Ant. Grouvelle, Rev. H. S. Gorham, and E. Candèze. Some of the new species are represented on coloured plates. F. M. van der Wulp continues his descriptions of exotic Diptera.

Mr. Schepman describes and figures a new Neritina from Gara, already named in manuscript by E. von Martens as *N. subocellata*, and Dr. Horst gives an ac-

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count of a new Entozoon from the coeca of *Struthio molybdophanes*, Rchw. This Nematoid (*Sclerostoma struthionis*) is figured on Plate 8.

A title-page and table of contents and index accompany the October part.

Solutions of Weekly Problem Papers. By the Rev. J. J. Milne, M.A. (London: Macmillan and Co., 1885.)

IN our notice of the "Weekly Problem Papers" we gave an account of the contents, and accorded to the collection a warm welcome. In the meanwhile we have gone through the major part of the papers, and have found the questions to be well suited for their purpose: here and there may occur occasional apparent exceptions, but if these are exceptions, then were they also in the original papers in which they occur.

The solutions are neat, and in several cases elegant, and in all the object of "increasing a student's stock of mathematical knowledge, and of teaching him to put it to a practical use" is well kept in view. Mr. Milne is prodigal in his solutions, as not unfrequently he gives two solutions of the same question. To compensate for the non-insertion of solutions already printed in the collections of Answers to the Tripos questions of 1875 and 1878, Mr. Milne appends a collection of an equal number of questions of a similar character, with their solutions; these, with two appendices, occupy about one-fifth of the whole volume. The two notes are on the geometrical theory of envelopes and geometrical maxima and minima.

We congratulate Mr. Milne on having so successfully carried out his design. We believe it was originally in his plan to trace each question up to its original proposer, but this very difficult task he has apparently abandoned, at any rate he makes no sign in this first edition.

The two books together will be of great service to students who cannot afford to read with a private tutor, as the solutions are written out in proper style, and are as full in explanation as a student could expect them to be. There is a long list of errata, but of these the greater part are due to the original papers. We have noticed several more, but this is not the place for indicating them, as the student will in most cases be able to detect them himself.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*

[*The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to insure the appearance even of communications containing interesting and novel facts.*]

Heat Quantities

IT would be a great advantage if some definite and generally-accepted meaning were attached to the words "capacity for heat," "thermal capacity," and "specific heat." As it is I find that scarcely two text-books give the same definitions of these quantities. The French writers, Verdet, Jamin, Fourier (Freeman's translation), and Deschanel (Everett's translation), seem to agree in considering specific heat a quantity of heat; so also do B. Stewart and Daniell. Prof. Everett, in "Units and Physical Constants," defines thermal capacity as a quantity of heat, and on p 79 says that specific heat is also a quantity of heat, while on p. 80 he points out that it is of zero dimensions. In Maxwell's and Garnett's books it is pointed out that specific heat is a ratio, but in the latter the term is used loosely later in the book. Glazebrook and Shaw, in their "Practical Physics," make it a ratio.

To avoid all this confusion, I would propose the following definitions, on the analogy of the accepted ones for density and specific gravity:—

"*Capacity for Heat.*—The quantity of heat required to raise the temperature of any body, under given conditions, by 1° C., is called its 'capacity for heat' under those conditions.

"*Thermal Capacity.*—The quantity of heat required to raise the temperature of unit mass of any material, under given conditions, by 1° C., is called its 'thermal capacity' under those conditions.

"*Specific Heat.*—The ratio of the thermal capacity of any material to the thermal capacity of some standard material is called its 'specific heat.' This standard material is usually water at 0° C. or 4° C."

If some such definitions as these were generally accepted, a good deal of confusion would be avoided, and the analogy with density and specific gravity would be accentuated. At the same time the word "specific" would be defined to mean that the quantity to which it was applied was a ratio, and of zero dimensions.

HARRY M. ELDER

Wellington College, Wokingham

Permanent Polarity of Quartz

THE second note in NATURE (Feb. 4, p. 325) contains an account of an "important discovery" by Dr. O. Tumlirz, which is wrong in all essential particulars. The permanent polarity discovered by that gentleman is not diamagnetic, but paramagnetic. Nor is it correct that "Dr. Tumlirz appears to think that these facts negative Becquerel's theory of diamagnetism," but on the contrary, he takes some trouble to show that his experiments are in complete agreement with that theory.

"Becquerel's theory (1850)" seems to be a name for the one discussed, though not adopted, by Faraday in his second paper (1845) on the subject, that all matter is magnetic, the medium occupying an intermediate position between so-called paramagnetic and so-called diamagnetic bodies.

ARTHUR SCHUSTER

[Dr. Tumlirz's own words are: "Der Bergkrystall ist hiermit der erste diamagnetische Körper der eine dauernde Polarität zeigt."—ED.]

Variegated Iridescent Halo

ABOUT noon of January 28 the sky was overcast by a horizontal cloud, and an iridescent halo appeared directly beneath the sun. The length of the arc was not measured, but appeared to be nearly or quite 90°. The most of the halo was of a bright yellow colour, but not far from the middle of the arc was a spot of green separated on each side from the yellow arcs by a short neutral tract. The green spot was nearly round, and its breadth (as measured from the sun) was nearly the same as that of the yellow arcs, and the angular distances from the sun of both the yellow and green arcs were approximately equal. Iridescent halos are seen here every year, usually as complete circles about the sun, and often showing all or several of the prismatic colours, each forming its own definite ring at different distances from the sun. Such halos appear through a thick haze, or quite thin cloud. This variegated halo appeared through a cloud so dense that the position of the sun could barely be made out by the eye, and it was of very variable density. The borders of the coloured arcs were not clearly defined, and apparently the light had been somewhat scattered by reflection upon the lower cloud particles. The temperature was several degrees below the freezing-point of water. Twice before during the present winter short monochromatic arcs of halos have appeared, once a yellowish-green, once a bright red.

The iridescent clouds recently seen by so many of your correspondents in Scotland appear to be, in part at least, the same phenomenon as here recorded, only in this case there was enough of the arc visible to definitely show that the colour was due to an iridescent halo.

G. H. STONE

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White Rainbows

PROBABLY A. E. E. will find some answer to his questions in the under-mentioned articles:—R. Smethurst, "Account of a White Solar Rainbow" (*Mem.* Phil. Soc., Manchester, iii. pp. 176-78, 1819); Aug. Bravais, "Observations sur le Phénomène de l'Arc-en-Ciel blanc" (*Proc. Verb.* Soc. Philom., pp. 33-35, 1846; *Ann. de Chimie*, xxi. pp. 348-61, 1847); F. Moigno, "Nouvelle Théorie de l'Arc-en-Ciel blanc" Moigno, *Cosmos*, [illegible] pp. 107-11, 1852-53); G. J. Symons, "On

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